

Significant Weather & Climate Events

2024



WORLD
METEOROLOGICAL
ORGANIZATION

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This is a supplement to the [WMO State of the Climate 2024 report](#). It expands on the summary of significant high-impact events in the main report, with a broader range of events included, including some events which were climatically extreme but had limited immediate impacts.

Tropical cyclones

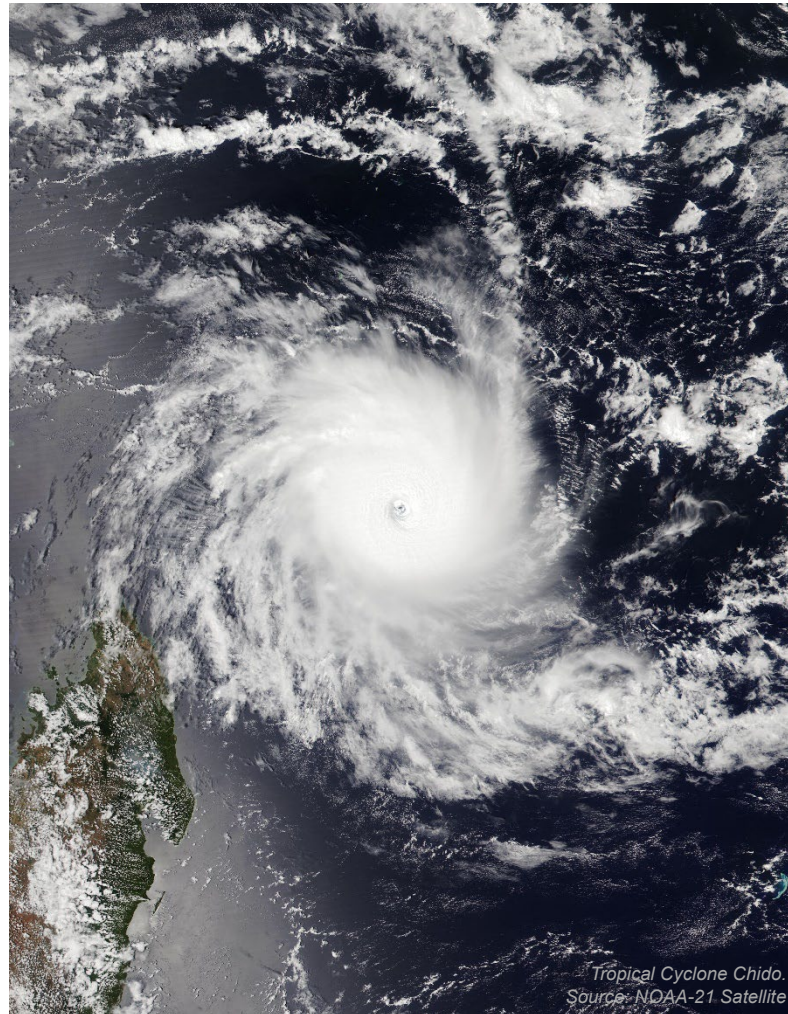
Overall Assessment

2024 has seen a near average total number of tropical cyclones globally, with the number of intense cyclones also near average. In contrast to 2023, there were relatively few long-lived cyclones, leading to relatively low values of the Accumulated Cyclone Energy (ACE) index, which combines intensity and duration.

In total, there were 86 tropical cyclones in the 2024 season¹, with numbers close to average in both the Northern and Southern Hemispheres. The North Atlantic had an above average season with 18 tropical cyclones, offset by a below average season in the Northeast Pacific (13), which had its latest season start in the satellite record. The world's most climatologically active tropical cyclone region, the Northwest Pacific, had a near-average season (26) after a slow start, while the North Indian Ocean was also close to average. For the second successive season, activity in 2023-24 was well below average in the South Pacific (east of 160 °E) with only four cyclones and was slightly below average (8) in the Australian region, but slightly above average (10) in the Southwest Indian Ocean.

The lack of long-lived intense cyclones in 2024 meant that the ACE index was below average in all regions except the North Atlantic, with the North Indian Ocean having its lowest value since 2012. In the North Atlantic, it was the first season since 2019 with multiple category 5 hurricanes.

Notable individual cyclones are discussed in the relevant regional sections.

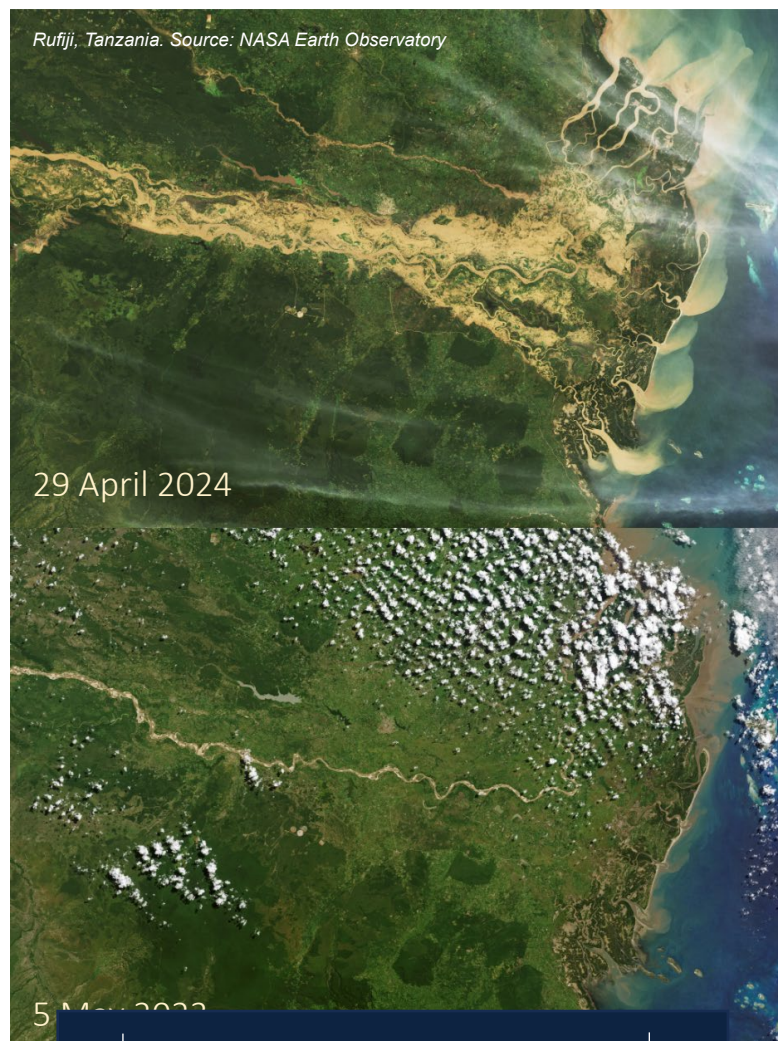


Cyclone Chido had major impacts in December with at least 172 deaths reported.

Africa

An exceptionally wet monsoon season resulted in long-lived and extensive flooding during the second half of 2024 across large parts of the Sahel region. Rainfall in 2024 was more than 50% above average over much of the region, with especially large anomalies in northern parts of the region as rains extended into normally arid areas. Significant flooding was reported in almost every country in the region, including Senegal, Mali, Burkina Faso, Niger, Nigeria, Cameroon, Chad, the Central African Republic and Sudan. In September, heavy rains extended into the northwest Sahara with significant flooding reported in Morocco and Algeria; 170 mm of rain was reported in Tagounite (Morocco) and 85 mm in 24 hours in Bechar (Algeria). Across the West and Central African region, to 31 October, 1,526 deaths were reported, with 639,000 houses damaged or destroyed, and over 1 million people displaced², with Chad and Nigeria among the most severely affected countries. Mediterranean storms associated with major flooding in Europe in October also had some impacts in northern Africa, with Lamta (Tunisia) receiving 147 mm in less than 24 hours.

Significant flooding affected parts of east Africa between March and May. Rainfall was especially heavy in Kenya, where seasonal rainfall was near double the long-term average in some parts of the western half of the country. The region was also affected in May by tropical cyclones tracking unusually close to the equator. Hidaya was the first tropical cyclone to make landfall at cyclone intensity in Tanzania since at least 1952 and brought 316.6mm rain to Kilwa on 4 May, whilst Ialy weakened below cyclone intensity off the Kenyan coast on 22 May, after becoming the first known tropical cyclone in Kenyan waters. Flooding was reported during the season in Kenya, Tanzania, Uganda, Rwanda, Burundi, Somalia and Ethiopia. Lake Victoria reached record high levels, contributing to downstream flooding later in the year in the Nile in South Sudan.



During the season, 282 flood-related deaths were reported in Kenya and 161 in Tanzania.

During the season, 282 flood-related deaths were reported in Kenya and 161 in Tanzania³. Later in the year, heavy rains on 21-22 July contributed to landslides in southern Ethiopia with at least 236 deaths reported⁴. Tropical Cyclone Chido had major impacts in December. After forming near the Mauritian island of Agalega on 10 December, it intensified rapidly and moved westwards, reaching peak 10-minute sustained wind speeds⁵ of 213 km/h and a central pressure of 935 hPa. It passed just north of Madagascar and crossed directly over the French territory of Mayotte on 14 December at near peak intensity, before making land near Pemba in northern Mozambique early on 15 December. It was the most intense landfall on Mayotte since 1934. The system weakened after landfall but went on to produce significant flooding in Malawi. There was major destruction in Mayotte, on Agalega and near the landfall point in Mozambique, along with significant impacts in the Comoros. At least 172 deaths were reported across Mayotte, Mozambique and Malawi⁶.

Parts of central Africa, particularly the Congo basin, were badly affected by floods in early 2024, which followed abnormally heavy rain in November and December 2023 in an area centred on the northern Democratic Republic of the Congo and the southern Central African Republic. The worst impacts were in the northern Democratic Republic of the Congo and downstream in the city of Kinshasa, where the Congo River reached its highest level since 1961⁷, but neighbouring countries were also affected. 300 deaths and the inundation of 1.6 million hectares of agricultural land were reported⁸ in the Democratic Republic of the Congo, with an additional 17 deaths reported⁹ in the Republic of the Congo.

A prolonged drought affected large parts of southern Africa during the year; for some areas it was the third successive year of drought. The worst-affected area was over a region encompassing much of Zimbabwe, northern Botswana, western Zambia and parts of Namibia. Over most of this region, rainfall from January to March 2024, a sensitive period for

crops, was more than 50% below average, and was the lowest in the satellite record in many locations. Widespread food security was reported in Zimbabwe, Zambia and Namibia; in Zambia, there was total crop failure over more than 40% of the area planted to maize and total grain production decreased by over 50% from the preceding year. Lake Kariba approached its minimum operating level late in the year, necessitating a major reduction in water releases for hydroelectric generation and major electricity shortages in Zambia and Zimbabwe. Other countries reporting drought impacts included Angola, Mozambique, Malawi and Lesotho. Rainfall in the region early in the 2024-25 rainy season has also been below average over significant areas, although parts of Botswana experienced significant flash flooding in mid-December. Northwestern Africa, extending from Morocco to Tunisia, also experienced continued long-term drought in many regions.

Major heatwaves affected large parts of west Africa and the Sahel during March and April, with temperatures in many inland areas regularly approaching or exceeding 45 °C. Some of the most extreme heat occurred in early April; on 3 April, Kayes (Mali) reached 48.5 °C and Ouagadougou (Burkina Faso) 44.5 °C. A number of stations in Mali observed their highest temperature on record during this period and 102 heat-related deaths were reported. In a later heatwave, N'Djamena (Chad) reached 46.6 °C on 24 April, and Matam (Senegal) 47.9 °C on 5 May. Other countries to report extreme heat during this period included Togo, Ghana and the Republic of the Congo.

Asia

An extreme heatwave affected Saudi Arabia in mid-June, during the peak of the Hajj pilgrimage season in Mecca. Temperatures at Arafat, near Mecca, reached 50.0 °C on 17 June and reached at least 43 °C on every day from 1 to 22 June. At least 1,301 deaths were reported during the pilgrimage, the large majority of which were partially or wholly attributable to the extreme heat. Later in the summer Bahrain International Airport reached 47.1 °C on 12 July, the second-highest July temperature on record there.

South and southeast Asia experienced extreme heat during the build-up period to the summer monsoon in April and May. In April and early May the heat was primarily focused on a region extending from eastern India and Bangladesh eastwards to Thailand, Cambodia, Laos and Vietnam, as well as the Philippines (see South-West Pacific section). Over 40 stations in Thailand experienced their highest temperatures on record in April and early May, including 41.1 °C at Bangkok Don Mueang Airport on 30 April. Vientiane Airport (Lao PDR) reached 42.6 °C, also on 30 April. Heat-related deaths were reported in a number of countries, including 38 in Thailand, and there were extensive school closures in Bangladesh. Later in May the heat was centred in India, particularly in the north, with 50.5 °C observed on 28 May at Churu (Rajasthan). 112 deaths were reported from extreme heat.

East Asia had a very hot summer. Japan had its equal hottest summer on record, matching 2023 with a national mean temperature 1.76 °C above the 1991-2020 average, with July being the hottest on record. Record warmth also occurred over much of the country in September and October, contributing to the warmest autumn on record. The Republic of Korea also had its hottest summer on record, while it was also an abnormally hot summer in many parts of China. 18 stations in China reached their highest temperature on record, including Yiwu (Zhejiang) with 42.8 °C.

Drought developed during August in parts of the Yangtze basin after earlier flooding in June in that region and in southeast China.

Tropical cyclones again caused large-scale destruction in Asia during 2024. The most significant event of the year was Typhoon Yagi in early September. Yagi formed northwest of Palau on 1 September and crossed the Philippines the next day, before intensifying rapidly over the South China Sea. On 5 September it reached peak intensity with a central pressure of 915 hpa. It weakened slightly before passing over China's Hainan province on 6 September with maximum sustained winds of 225 km/h, the second-strongest landfall in record in China, before continuing to move westward and making its final landfall near Haiphong in northern Vietnam on 7 September, the strongest system to make landfall in Vietnam in the last 30 years. The remnant system continued to move westward over northern Vietnam and Lao People's Democratic Republic. A maximum wind gust of 223 km/h was recorded in Bai Chay¹⁰ (Vietnam), while Nam Dan received 781 mm of rain in the week 6-12 September and many other stations exceeded 500 mm. Some stations in Myanmar also had three-day totals exceeding 500 mm. There was major wind damage in China and Vietnam, and widespread and severe flooding across the region. At least 328 deaths were reported in Myanmar and 299 in Vietnam, and more than 700 in total, with Lao PDR, China, Thailand and the Philippines also affected. 235,000 houses were reported to have been destroyed in Vietnam¹¹.

Other noteworthy tropical cyclones of the season in eastern Asia included Typhoon Gaemi, which made landfall in Fujian province (China) after earlier crossing northern Taiwan with maximum sustained winds¹² of 175 km/h. Gaemi produced severe flooding both near its landfalls, and later as a remnant system in northeast China and the Democratic People's Republic of Korea, with rainfall totals of up to 650 mm in Liaoning province.

A number of rivers in northeast China reached record flood levels. Typhoon Bebinca made landfall in Shanghai on 16 September with maximum sustained winds of 150 km/h, the strongest cyclone to hit the city since 1949. The most significant impact of the year in Japan was that of Typhoon Shanshan, which crossed the Ryukyu Islands before making landfall near Kagoshima on 29 August, having weakened only slightly from its peak intensity with a minimum central pressure of 935 hPa.

Although the North Indian Ocean tropical cyclone season was less active than in most recent years, a number of systems still had substantial impacts. The most significant was Tropical Cyclone Remal, which formed in the Bay of Bengal on 24 May and made landfall on 26 May near the India-Bangladesh border, with maximum sustained wind speeds of 110-120 km/h.

Very heavy rainfall fell near its track as it moved inland, with Cherrapunji in northeast India receiving 660 mm in 24 hours¹³. A maximum storm surge of 3.8 m was observed in Bangladesh. At least 57 deaths were reported in India and Bangladesh¹⁴, predominantly in northeast India from flooding and landslides. Cyclone Asna was the first August cyclone in the Arabian Sea for over 40 years, whilst Cyclone Fengal caused significant flooding in Sri Lanka and southern India in late November and early December.

Afghanistan, along with neighbouring areas of Pakistan and Iran, suffered a succession of disasters in late winter and spring, with abnormal cold and highland snow in late February and early March, then several flood events over the following months, the worst of which affected Afghanistan between 10 and 17 May.

Japan Meteorological Agency

Typhoon Yagi was the most intense storm in Asia in 2024, caused catastrophic destruction across Asia, with record-breaking landfalls in China and Vietnam and more than 700 lives lost.

Pakistan had its wettest April on record with the largest rainfall anomalies in areas near the Afghanistan border, while a number of locations set record low daily maximum or minimum temperatures for March between 1 and 5 March, including Quetta with a maximum of -1.5°C on 2 March. Several hundred deaths were reported in the flooding with the cold wave also resulting in significant loss of life. This followed significant drought conditions in Afghanistan up until early 2024.

Significant spring flooding also occurred in late March and April in northern Kazakhstan and adjacent border areas of the Russian Federation, resulting from rapid melting of a heavier-than-average snowpack after a warm second half of March. Petropavl (Kazakhstan) and Orenburg (Russian Federation) were particularly badly affected with significant parts of both cities inundated. In Kazakhstan, where it was reported as the most significant natural disaster in the country in the last 80 years, reconstruction costs were estimated to exceed US\$700 million, while over 10,000 residential properties were inundated in the Russian Federation.

Very heavy rainfall affected parts of the Persian Gulf region in mid-April with daily rainfall in some areas exceeding long-term annual averages. In the United Arab Emirates, 259.5 mm fell at Khatm Al Shakla (Al Ain) in 24 hours, amongst the heaviest rainfall totals in the UAE since records began in 1949. Dubai Airport received 162.8 mm in 36 hours from 15-16 April, including 142.0 mm on the 16th, severely disrupting flights. Heavy rainfall and flooding also affected Bahrain, Oman and Iran.

South Asia experienced numerous floods during the southwest monsoon season. Amongst the most significant events occurred in Nepal in late September. Much of the eastern half of Nepal received over 200 mm of rain over the three days 27-29 September, with a peak of 517 mm at Daman. On 28 September, 25 stations, including Kathmandu Airport (239.7 mm), had their wettest day on record¹⁵. The Narayani River at Devghat exceeded its previous record flood level by 3.5 m and severe

flooding occurred in the Kathmandu Valley and elsewhere. At least 250 deaths were reported¹⁶.

Major landslides occurred in the Wayanad district of northern Kerala in India on 30 July following extreme rainfall, with totals locally exceeding 500 mm in the 48 hours prior to the event¹⁷. 385 deaths were reported as a result of the event. Other floods during the monsoon season also led to significant loss of life, and 109 deaths were reported across India from lightning strikes on 10 and 11 July. Pakistan had its second-wettest August on record (after the extreme flood year of 2022), with Lahore Airport receiving 337 mm on 1 August. This contributed to overall July-September nationally averaged rainfall 51% above average. As of 13 September, 357 deaths in Pakistan¹⁸ had been attributed to monsoon-related flooding.

Mongolia experienced unusually severe winter weather conditions in 2023–24. Although winter temperatures were close to long-term averages, precipitation was heavier than usual, resulting in abnormally heavy and persistent snow and ice cover (known locally as *dzud*), preventing animal access to pasture and resulting in heavy stock losses. By May 2024, 7.2 million head of livestock had been lost, 11% of the national herd¹⁹.

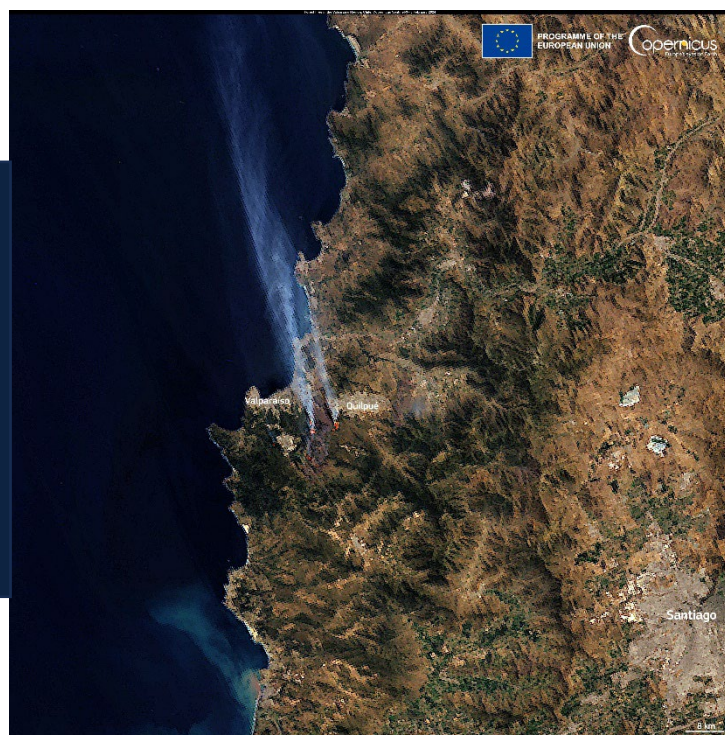
South America

Some of the most destructive fires recorded in South America occurred in Chile in late January and February, as dry conditions typical of summer combined with low humidity, high temperatures and strong winds to produce episodes of extreme fire weather. Santiago had five consecutive days above 35 °C from 30 January to 3 February, including its third-highest January temperature on record, 37.3 °C, on 31 January. The most destructive fire broke out south of Viña del Mar on 2 February and moved rapidly northwards into the urban area, destroying more than 6,500 homes. At least 134 deaths were reported²⁰ from the fires, the most known from a wildfire in South America. Other fires affected numerous other parts of central and southern Chile. Chile has been experiencing long-term drought, with nationally averaged rainfall below the 1961-1990 average for 17 consecutive years from 2007 to 2023, although relatively wet conditions prevailed later in 2024. Severe drought continued to impact many parts of South America, particularly the Amazon basin, which had rainfall well below average for the second successive year.

The Rio Negro at Manaus reached record low levels, reaching a minimum level of 12.11 m from 9 to 12 October, 0.59 m below the previous record set in 2023 and more than a metre below the lowest pre-2023 level. The Paraguay River at Asuncion also reached record low levels in September, causing significant disruptions to river transport, and the Pantanal in Brazil experienced its most significant drought in 70 years. There was extensive fire activity through much of the region, including the Pantanal and adjacent areas of Bolivia. 192,700 fire starts were reported in the Amazonia region of Brazil^{21,22}, the most since 2010, while Bolivia (with a record 90,026 fire starts) and Venezuela also had fire activity well above average.

While generally not as extreme or as extensive as in 2023, there were also numerous significant heatwaves during the year, including in Argentina in January and February and in various parts of Brazil during the second half of the year, and Brazil had its hottest September in the post-1961 record.

134 deaths were reported from the fire south of Viña del Mar, Chile—the most known from a wildfire in South America.



Tingo de Ponaza (Peru) reached 41.8 °C on 26 October, equalling the national record set in 2022. In contrast to the drought conditions prevailing in many other parts of South America, severe flooding affected far southern Brazil in late April and early May, with Rio Grande do Sul state being worst affected. A slow-moving low pressure system off the coast resulted in a persistent moist easterly flow over land and prolonged heavy rainfall. Santa Maria received 213.6 mm of rainfall on 1 May and 470.7 mm over three days, while Soledade received 498 mm over the five days from 1 to 5 May. The Guaíba Lake reached record high levels, 0.55 m above the previous record set in 1941, and inundating large parts of the city of Porto Alegre and surrounding regions. 182 deaths were reported²³ and over 420,000 people were displaced, with several billion US\$ in economic losses²⁴, making it one of the most costly meteorological disasters on record in South America. Earlier in the year, local flooding associated with El Niño was reported in Ecuador and Peru, although on a smaller scale than in some previous El Niño years.

Significant cold affected parts of southern South America in late autumn and winter. May was persistently cold in much of Argentina, with monthly mean temperatures 3 °C to 6 °C below average over large parts of the country and many stations experiencing their coldest May on record. Chile was also cold with Santiago having its coldest May since 1950. June was very cold with extensive snowfall in southern Argentina, with the coldest June on record at El Calafate, Rio Gallegos and Rio Grande, while a major cold outbreak in the first two weeks of July brought persistent low temperatures in northern and central Argentina, Uruguay and parts of Paraguay and southern Brazil.

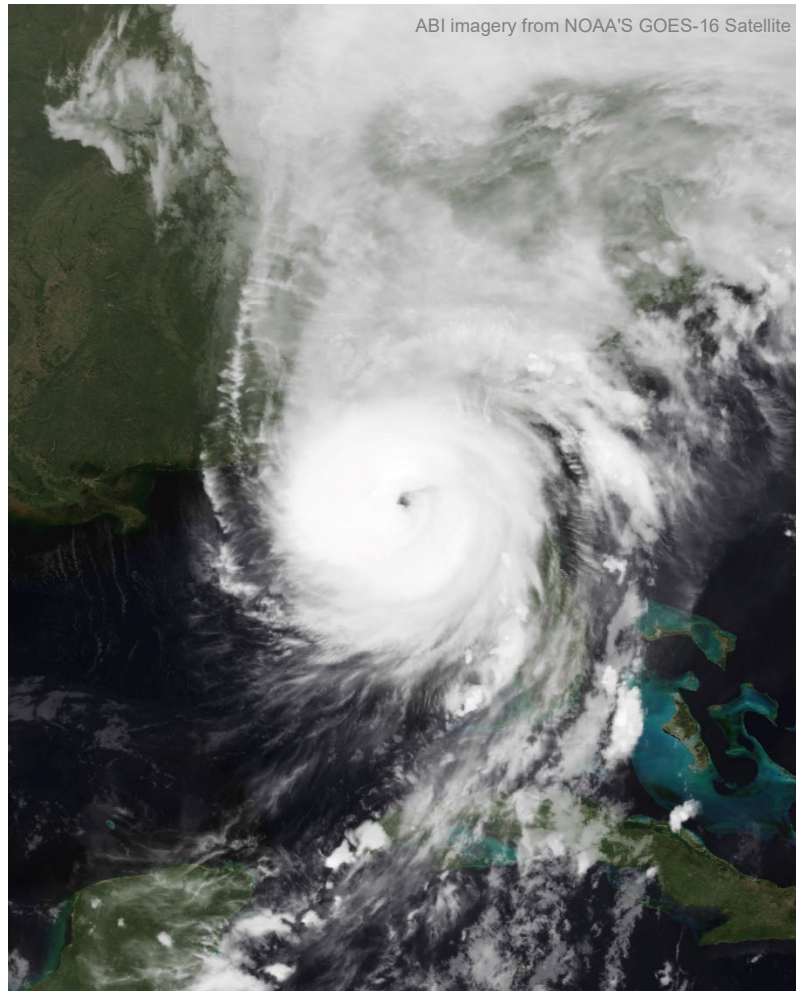


Flooding around Porto Alegre, Brazil led to 182 reported deaths, over 420,000 people displaced, and several billion US\$ in economic losses, making it one of the costliest meteorological disasters on record in South America.

North America, Central America and the Caribbean

Several hurricanes had major impacts in the region during 2024. Hurricane Helene made landfall as a category 4 system in the Big Bend region of Florida on 26 September, before tracking northwards into the interior southeast of the United States. Whilst there was major wind and storm surge damage in the landfall area, the bulk of Helene's impacts came from inland flooding and associated landslides, especially in western North Carolina but also in Georgia, western South Carolina and eastern Tennessee. Three-day rainfall totals from 25 to 27 September reached 781 mm at Busick, northeast of Asheville. Asheville itself received 355 mm, about 70% above its previous three-day record. Power, water, transport and communications were badly disrupted throughout the region for weeks after the event. At least 219 deaths were attributed to Helene, the greatest loss of life in a mainland United States hurricane since Katrina in 2005, with economic losses assessed at US\$78.7 billion, the largest economic loss for any event globally in 2024 and the largest for an inland flooding event in the United States.

Two weeks after Hurricane Helene, Hurricane Milton also made landfall on the west coast of Florida. Milton reached a peak intensity of category 5 with 290 km/h maximum sustained 1-minute winds and a central pressure of 897 hPa, but weakened to category 3 before its landfall south of Tampa on 9 October. There was major wind and storm surge damage along the coast with 32 deaths reported and estimated economic losses of US\$34.3 billion, and the system also produced numerous tornadoes, although the worst storm surge missed the densely populated Tampa metropolitan area.



Hurricane Helene's economic losses were US\$78.7 billion, the largest economic loss for any event globally in 2024.

Earlier in the season, Hurricane Beryl also reached category 5 intensity in the Caribbean Sea on 2 July, the earliest in the year that a category 5 system has occurred in the North Atlantic. After weakening as it crossed the Yucatán Peninsula, it reintensified to a category 1 hurricane over water before its final landfall in Texas on 8 July. There was widespread destruction in Grenada and Saint Vincent and the Grenadines during its Caribbean phase, with significant impacts also in countries including Barbados, Trinidad and Tobago, St. Lucia, Jamaica, Mexico, the Dominican Republic, and Venezuela. After landfall in the United States, there was significant flooding in Texas and a large tornado outbreak affected Texas, Louisiana and Arkansas. 46 deaths were attributed to the hurricane in the United States, mostly in the Houston area, with casualties also reported in Venezuela, Jamaica, Grenada and Saint Vincent and the Grenadines. Economic impacts in the United States were estimated at US\$7.2 billion. Hurricane Debby and its remnants caused widespread heavy rain and flooding in eastern North America in early August. Its impact was particularly significant in eastern Ontario and southern Quebec in Canada, where Montreal had its wettest day on record with 154 mm on 9 August. Insured losses in Quebec exceeded US\$1.7 billion²⁵, the most costly weather event on record in the province.

Hurricane Rafael in November had significant impacts in Cuba, including contributing to widespread power outages.

Drought affected many parts of the region in 2024. Very dry conditions in Mexico, which had experienced its driest year on record in 2023, continued into the first half of 2024, with April being the third-driest on record and May the second-driest. Dry conditions also contributed to significant wildfires in Belize in May, while Caribbean areas to experience significant drought included Grenada and Trinidad and Tobago. Substantial rain, some of it associated with tropical cyclones, eased drought conditions in eastern and southern Mexico from June onwards, but severe drought continued in the northwest along with adjacent border areas of the interior southwest of the United States. Drought also generally eased during the second half of the year in other parts of Central America, with Panama and Costa Rica reporting significant flooding in November associated with the precursor disturbance to Hurricane Rafael, and tropical cyclones bringing substantial rain to some other parts of the region. In Canada, a wet late spring and summer eased drought conditions in much of the eastern half of the country but it remained dry in parts of the west, while in the United States, a dry summer and autumn saw drought extend over many parts of the country.

Mexico had its most active wildfire season on record with 1.64 million hectares burned.



54.1% of the continental United States was reporting moderate to exceptional drought by the end of October. Autumn was especially dry in the northeast, with Philadelphia experiencing a record 42 consecutive days without measurable rainfall from 29 September to 9 November, and there was abnormal wildfire activity in the region in November.

It was an active wildfire season throughout North America. Mexico had its most active wildfire season on record with 1.64 million hectares burned (to 7 November). 5.3 million hectares were burned in Canada, substantially less than in 2023 but still more than double the long-term average, and 3.3 million hectares in the United States, 20% above the 2001-2020 average. The most significant fire of the year occurred in the Jasper region of western Canada in late July, with about one-third of the town of Jasper being lost and insured losses of US\$600 million, the second-largest on record for a Canadian wildfire. It was the second-costliest wildfire on record in Canada after the 2016 Fort McMurray fire.

Extreme heat affected Central America regularly from March to June. Mexico had several significant heatwaves and reported its hottest May on record. Mexico City reached its highest temperature on record (34.7 °C) on 25 May, while Tepache in northwest Mexico reached 52.0 °C on 20 June. In the southwest United States, for the second successive year it was an exceptionally hot summer, with Arizona and California each having their hottest summers on record. Phoenix had 113 consecutive days of 100 °F (37.8 °C) or above from 27 May to 16 September, well in excess of the previous record of 76 days, whilst notable record high temperatures included Las Vegas (48.9 °C on 7 July) and Palm Springs (51.1 °C on 5 July). At least 466 heat-related deaths were reported²⁶ in 2024 in Maricopa County, which includes metropolitan Phoenix. Extreme heat also affected parts of the eastern United States with a record high 41.1 °C at Raleigh-Durham on 5 July.

Abnormal heat reached the Arctic coast of Canada in August with Inuvik reaching 34.8 °C on 7 August, more than 2 °C above its previous record.

Severe cold affected parts of western Canada and adjacent areas of the United States in January. Penticton, in the southern interior of British Columbia, reached -27.6 °C on 13 January, its lowest temperature on record. Significant damage was reported to fruit trees in the region, some of which already had buds after a warm start to winter. Abnormally cold conditions extended to much of the southern interior of the United States in mid-January, with significant snowfall as far south as northern Alabama.

The United States had one of its most active severe storm years on record. A preliminary 1,882 tornadoes were reported in 2024, more than 50% above the 1991-2020 average and one of the four most active years on record, along with 2011, 2008 and 2004. May was especially active with 571 tornadoes. Over \$45 billion in economic losses were associated with severe storms during 2024 (not including those associated with hurricanes or tropical storms), although the number of fatalities was below the long-term average. In Canada, a hailstorm with hail 7-8 cm in diameter hit Calgary on 5 August with widespread damage, particularly to motor vehicles. Insured losses exceeded US\$1.8 billion, the most for a hailstorm in Canada.

South-West Pacific

The Philippines experienced a notable sequence of tropical cyclones in October and November. In a period of less than a month between 24 October and 17 November, five tropical cyclones made landfall in the Philippines, all crossing the island of Luzon (and in some cases also other islands), while a sixth passed close enough to the coast to have significant impacts. Although it was the least intense storm in the sequence, Tropical Storm Trami (Kristine) had the greatest impacts, principally through severe flooding as more than 300 mm of rain fell over large areas as it crossed the region on 24 and 25 October. Daet received 528.5 mm rain in 24 hours. Trami went on to make a second landfall on the central coast of Vietnam on 27 October. 159 deaths were reported²⁷ in the Philippines, with more reported in Vietnam and Hainan Island (China), and more than 200,000 houses were damaged. The most intense landfall was Typhoon Man-Yi (Pepito), which made landfall on 16 November in Catanduanes province at near peak intensity, with a central pressure of 920 hPa. 14 deaths were reported²⁸ from this system.

Earlier in the season, the Philippines was also impacted by the strongest typhoon of the season in the Northwest Pacific, Krathon (Julian), which reached a minimum central pressure of 920 hPa on 1 October in waters between the Philippines and Taiwan. Basco received 727.8 mm of rain in 24 hours. Flooding in July associated with Typhoons Gaemi (Carina) and Prapiroon (Butchoy), combined with monsoon rains, also had significant impacts through the country. Earlier in the year, extreme rainfall in late January and early February in eastern Mindanao, associated with an active phase of the northeast monsoon, caused significant flooding and contributed to a landslide on 6 February in which at least 93 deaths were reported²⁹.

Significant flooding occurred in northeastern peninsular Malaysia in late November and early December, associated with an active phase of the northeast monsoon. Besut, in Terengganu state, received 675 mm on 27 November. Six deaths were reported, and 137,000 people were displaced.

In a period of less than a month between 24 October and 17 November, five tropical cyclones made landfall in the Philippines, all crossing the island of Luzon.



It was also the wettest November on record for Singapore based on island-wide average rainfall. The Indonesian Island of Sumatra experienced significant flash flooding in March, with daily rainfalls up to 505 mm on 8 March at Limau Manih Andalas University, in the city of Padang. Overall, rainfall in 2024 was average to above average over most of Malaysia and Indonesia, except for parts of eastern Sumatra and eastern Borneo.

For the second successive year, there was widespread major flooding in northern Australia during the tropical wet season. The first significant single flood episode, resulting from a tropical low, affected the Northern Territory during mid-January, focused on the Victoria River catchment in the northwest. Victoria River Downs received 315.4 mm of rain in four days from 15 to 18 January. There were further heavy rain episodes through to late March, with record flood heights on the McArthur River at Borroloola after Cyclone Megan crossed the Gulf of Carpentaria coast on 18 March. Victoria River Downs's ultimate annual total of 1513.4 mm, most of which fell between January and March, exceeded its previous record by more than 300 mm. There was also major flooding in the Nullarbor region in southern Western Australia, badly disrupting road and rail transport between Western Australia and the eastern states, with 325.4 mm of rain falling in four days at Eyre from 9-12 March.

In New Zealand, there was significant flooding in early October in the southern and eastern South Island, particularly in and around the city of Dunedin, with numerous properties inundated and many road closures. Dunedin (Musselburgh) received 131 mm of rain on 3 October, its wettest October day on record.

Extreme heat affected the Philippines at various times during the year, most significantly in April at the same time as a major heatwave in mainland southeast Asia (see Asia section). On 27 April, 38.8 °C was observed at Ninoy Aquino International Airport, the highest temperature on record for a site in metropolitan Manila. Records were

also set at a number of other Philippines locations. Numerous heatwaves were also reported in Malaysia between February and May.

A significant heatwave affected Western Australia in February. On 18 February, Carnarvon reached 49.9 °C and Geraldton 49.3 °C, in both cases more than 2 °C above the previous highest observed in more than 100 years of data. Emu Creek reached 48 °C on four consecutive days from 17 to 20 February, the first time this had occurred at an Australian location. 2023-24 was the hottest summer on record for many parts of Western Australia. Later in the year, a notable early-season heatwave brought an Australian record high temperature for August of 41.6 °C on 26 August at Yampi Sound (Western Australia), while there were also August records for the Northern Territory (40.0 °C at Bradshaw – Angallari Valley), South Australia (39.4 °C at Oodnadatta) and Queensland (39.7 °C at Birdsville and Boulia).

Europe

Extreme rainfall resulted in severe flash flooding in the Valencia region of Spain on 29 October, associated with an upper-level cold pool over southern Spain. An easterly flow originating over very warm Mediterranean waters rose over mountains inland from Valencia, resulting in near-stationary thunderstorms which produced very heavy rain over the area for several hours. Turis, about 30 km west of Valencia, received 184.6 mm of rainfall in one hour – a Spanish national record – 620.6 mm in six hours, and 771.8 mm in 24 hours, with storm totals exceeding 300 mm recorded at a number of other locations west of Valencia. Although Valencia city itself received little rain, the extreme falls to the west resulted in exceptional flooding downstream, severely impacting many southern areas of the city along with surrounding communities. 223 deaths were reported³⁰ in the Valencian Community, the most significant loss of life in a single flood in Europe for several decades. Estimated economic losses in the Valencia region are at least US\$17.5 billion.

There were also a number of significant flash flooding episodes elsewhere in the Mediterranean region during autumn. In Bosnia and Hercegovina, extreme localised rainfall in central areas of the country on 3-4 October, with a daily total of 334.8 mm at Jablanica, resulted in severe flash flooding and 27 reported deaths, most in the village of Donja Jablanica. There were a number of extreme rainfall episodes during October in southern France, with Mayres (in the Ardèche region) receiving 694 mm in 60 hours from 16-18 October, while during a second episode from 25-27 October, Vidauban in southeast France received 119 mm in one hour. Parts of Italy, especially around Bologna and Milan, also experienced extreme local rainfall and flash flooding in September and October.

Central Europe also experienced a number of significant flooding episodes in 2024, most notably in late May and early June, and in September. The September floods, resulting from a slow-moving low-pressure system (known locally as storm *Boris*), were associated with exceptional precipitation.



Estimated economic losses from flooding in the Valencia region are at least US\$17.5 billion.

In Austria, St. Polten received 225 mm in 24 hours on 14-15 September, the second-highest daily rainfall on record in Austria, and 409 mm over the five days 12-16 September, more than double the previous record at the site. Most of northern Austria had its wettest five-day period on record. Daily totals exceeding 200 mm and five-day totals exceeding 400 mm also occurred in Czechia, with Loučná nad Desnou receiving 704 mm over six days, with 385.6 mm on 14 September, a national record for daily precipitation. Flooding was particularly severe in Czechia and southwest Poland, where floods on some rivers exceeded previous records set in 1997. Slovakia, Romania, Germany and Hungary were also affected. It was also an abnormally cold system, with snow falling above 600 metres in Austria and record September snow depths at some locations. Wien (Höhe Warte) had a maximum temperature of 8.5 °C on 13 September. 27 deaths were reported³¹ across the region. At the end of May, heavy rain in a region centred on southern Germany, with daily totals locally exceeding 100 mm, led to significant flooding both in the region, and downstream in the Danube catchment over the following days.

While they did not experience individual extreme events on the scale that occurred elsewhere, parts of northwestern Europe had persistent wet conditions for much of 2024, following a very wet finish to 2023. 2024 was the wettest year on record at locations including Paris-Montsouris (France) (901.1 mm) and Uccle (Belgium) (1170.7 mm), while the 12 months from October 2023 to September 2024 were the wettest on record for Germany, and August 2023 to July 2024 the wettest for the Netherlands.

There were a number of significant severe thunderstorm episodes during the summer, with the most widespread occurring in the second week of July. Damaging hailstorms occurred in Slovenia on 13 July with 10 cm hail reported at Slovenska Bistrica, while wind damage and flash flooding were also reported between the 11th and 13th in Slovakia and southern Poland. A microburst on July 9 caused significant damage in Mechelen (Belgium).

Earlier, two long-lived hailstorms crossed Bulgaria on 13 June, with hail up to 8.5 cm in diameter, and significant damage to crops and vehicles.

Extreme heat in Europe in the summer of 2024 was focused on the continent's southeast and the eastern Mediterranean, although almost the whole continent experienced above-average summer temperatures. It was Europe's hottest summer on record in NOAA and ERA5 data. Mean summer temperatures for summer in Serbia were about 1 °C above the previous record set in 2012, with each of June, July and August also setting records. While the summer was more notable for persistent heat than for individual extremes, with Belgrade having a record 67 days of 30 °C or above, on 14 August there were record high temperatures in Sombor (Serbia) and Zenica (Bosnia and Hercegovina) of 40.6 °C and 42.7 °C respectively. The minimum of 30.6 °C at Vrsac on 13 July was a national record for Serbia. Sandanski (Bulgaria) had nine consecutive days above 40 °C from 10 to 18 July, the longest such sequence observed in Bulgaria in the post-1932 record. Israel had its hottest summer on record, and Cyprus its hottest June and July. Some areas also reported significant drought during the summer and preceding months, including Bosnia and Hercegovina, Bulgaria, Hungary, and southern Italy. Agricultural losses from drought in Sicily over the 12 months to August were assessed at EUR 3 billion. There was also summer drought in Poland, with the river water level at Warsaw-Bulwary reaching a record low level on 10 September (just before the onset of flooding).

Much of the Nordic region was abnormally cold in early January, the culmination of an extended period of below-average temperatures from October 2023 to January 2024. Vittangi in northern Sweden reached -44.6 °C and Enontekiö in northern Finland -44.3 °C on 5 January, the lowest temperatures in those countries since 1999, while on 4 January Kautokeino (-43.5 °C) registered Norway's lowest January temperature since 1999.

Kvikkjokk (Sweden), with -43.6°C on 3 January, had its lowest temperature in 137 years of data, while on 6 January Bjørnholt, on the northern fringe of Oslo, reached -31.1°C , the lowest temperature on record in the Oslo region. Heavy snow caused disruption in eastern parts of southern Sweden. 2023-24 was the coldest winter in Iceland since 1994-95.

The summer in the Arctic, north of mainland Europe, was very warm, and Svalbard airport recorded the warmest summer for the third consecutive year, with a mean temperature of 8.5°C , 3.0°C above normal. Both Bear Island and Svalbard airport recorded for the first time monthly mean temperatures above 10°C in August, at 11.1°C and 11.0°C , respectively. The previous records were 8.2°C in 2013 and 8.4°C in 2023, respectively.³²

Agricultural losses from drought in Sicily over the 12 months to August were assessed at EUR 3 billion.



Endnotes

¹ For these purposes, the 'season' is defined as the combination of the 2023-24 Southern Hemisphere season (1 July 2023 to 30 June 2024) and the 2024 Northern Hemisphere season (starting 1 January 2024).

² <https://www.unocha.org/publications/report/chad/west-and-central-africa-flooding-situation-overview-31-october-2024>

³ <https://www.unicef.org/esa/press-releases/almost-1-million-people-kenya-burundi-tanzania-and-somalia-affected-unprecedented>

⁴ <https://reliefweb.int/report/ethiopia/ethiopia-africa-landslides-and-windstorm-emergency-appeal-no-mdret036-revised-operational-strategy>

⁵ From operational warnings (Meteo-France), may be refined in later assessment.

⁶ Sources: 120 Mozambique - [OCHA](#), citing National Institute for Natural Disasters . 13 Malawi - EM-DAT. 39 Mayotte - French national contribution .

⁷ <https://cerf.un.org/what-we-do/allocation/2024/summary/24-RR-COD-63589>

⁸ <https://reliefweb.int/report/democratic-republic-congo/republique-democratique-du-congo-flash-update-2-de-graves-inondations-affectent-18-provinces-mis-jour-au-6-fevrier-2024>

⁹ https://gouvernement.cg/communiqu%C3%A9/gouvernement-de-la-republique-a-la-suite-des-graves-inondations-qui-touchent-notre-pays/?fbclid=IwAR0GcaPatPoKHRqN13Nto6z2j0Sth92q_gxADyZcwKK20iFWPLfxSIVxHU

¹⁰ https://www.typhooncommittee.org/19IWS/docs/Members%20Report/Viet%20Nam/Members%20Report%202024_Vietnam_update.pdf

¹¹ <https://ahacentre.org/situation-update/situation-update-no-8-combined-effects-of-tropical-cyclone-yagi-and-southwest-monsoon-27-september-2024/>

¹² <https://www.typhooncommittee.org/19IWS/docs/Members%20Report/CHina/Member%20Report%5bChina%5d.pdf>

¹³ [https://rsmcnewdelhi.imd.gov.in/download.php?path=uploads/report/26/26_4a868b_Severe%20Cyclonic%20Storm%20REMA-L-A%20Brief%20Report_03June\(Approved\).pdf](https://rsmcnewdelhi.imd.gov.in/download.php?path=uploads/report/26/26_4a868b_Severe%20Cyclonic%20Storm%20REMA-L-A%20Brief%20Report_03June(Approved).pdf)

¹⁴ <https://www.tbsnews.net/bangladesh/20-dead-tk7482-crore-loss-incurred-due-cyclone-remal-state-minister-tells-js-882701>

¹⁵ https://www.dhm.gov.np/uploads/dhm/downloads/Situational_Report_on_Extreme_Precipitation_and_Flooding_Event_of_27-29_September_2024.pdf

¹⁶ <https://bipad.gov.np/np/1354>

¹⁷ Landslide triggering rainfall made more intense by human-induced climate change, devastating highly vulnerable communities in northern Kerala – World Weather Attribution

¹⁸ <https://www.ndma.gov.pk/storage/sitreps/October2024/gXzrhlenhal38kbEdUfi.pdf>

¹⁹ <https://reliefweb.int/report/mongolia/gIEWS-update-mongolia-6-may-2024-extreme-winter-weather-known-dzud-driving-acute-food-insecurity-pastoral-households-country>

²⁰ <https://reliefweb.int/report/chile/unicef-chile-humanitarian-flash-report-no2-wildfires-07-march-2024>, quoting Forensic Medical Service.

²¹ https://terrabrasilis.dpi.inpe.br/queimadas/situacao-atual/estatisticas/estatisticas_estados/

²² https://terrabrasilis.dpi.inpe.br/queimadas/situacao-atual/estatisticas/estatisticas_paises/

²³ <https://defesacivil.rs.gov.br/defesa-civil-atualiza-balanco-das-enchentes-no-rs-10-7>

²⁴ \$7B in EM-DAT, though some other sources are lower.

²⁵ <https://www.canada.ca/en/environment-climate-change/services/ten-most-impactful-weather-stories/2024.html>

²⁶ <https://www.maricopa.gov/1858/Heat-Surveillance>

²⁷ https://ndrrmc.gov.ph/attachments/article/4271/SitRep_No_37_for_Combined_Effects_of_TC_KRISTINE_and_L_EON_2024.pdf

²⁸ https://ndrrmc.gov.ph/attachments/article/4274/SitRep_No_34_for_the_Combined_Effects_TC_NIKA_OFEL_and_PEPITO_2024.pdf

²⁹ <https://reliefweb.int/report/indonesia/asia-and-pacific-weekly-regional-humanitarian-snapshot-13-19-february-2024>

³⁰ <https://www.lamoncloa.gob.es/info-dana/Paginas/2024/131224-datos-seguimiento-actuaciones-gobierno.aspx>

³¹ European Commission Emergency Response Coordination Centre daily map, 27 September 2024, available at https://en.wikipedia.org/wiki/File:ECDM_20240927_Central_Europe_Floods.pdf